Unlocking Opportunities in STEM with INETEC

February 2025

INETEC

- **35 years** of pioneering tech & ensuring nuclear safety
- Expertise in **robotics, probes, instruments, software,** and **NDT inspections**
- Strong impact on **global projects** - ITER (fusion energy), SMR, and ESA

Why STEM talent is crucial for our success?

Driving Innovation & Growth

Leading in Technology & Industry

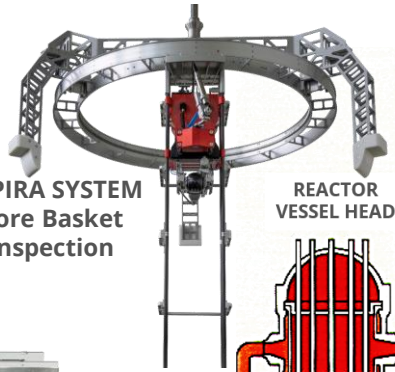
Ensuring Excellence & Safety

Who we are

- **Engineers, scientists,** and **visionaries** solving the world's toughest challenges
- **Passionate**, **innovative,** and **flexible**
- Invent technologies that **protect, improve, and inspire** the industries of tomorrow
- Perform **inspections and maintenance** of all types of nuclear reactors
- Excited to connect with **curious STEM talents**

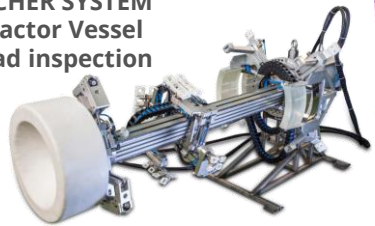
That’s what INETEC does

Nuclear

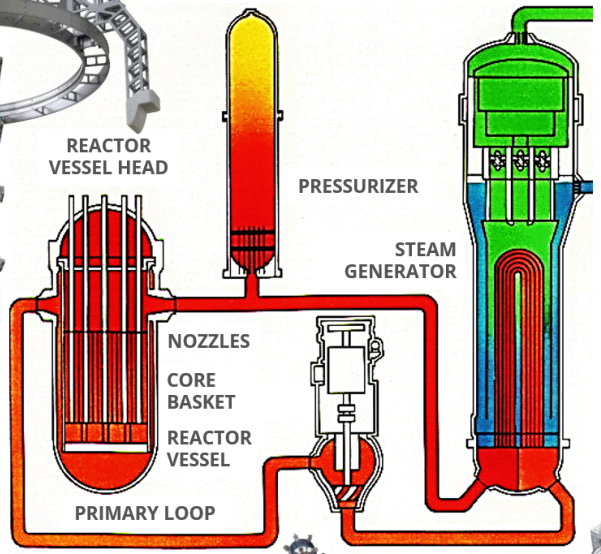


ASPIRA SYSTEM
Core Basket
inspection

ARCHER SYSTEM
Reactor Vessel
Head inspection



ORCA SYSTEM
Reactor Vessel
nozzle inspection



ZENITH SYSTEM
Pipes inspection

VERSO SYSTEM
Pressurizer inspectio

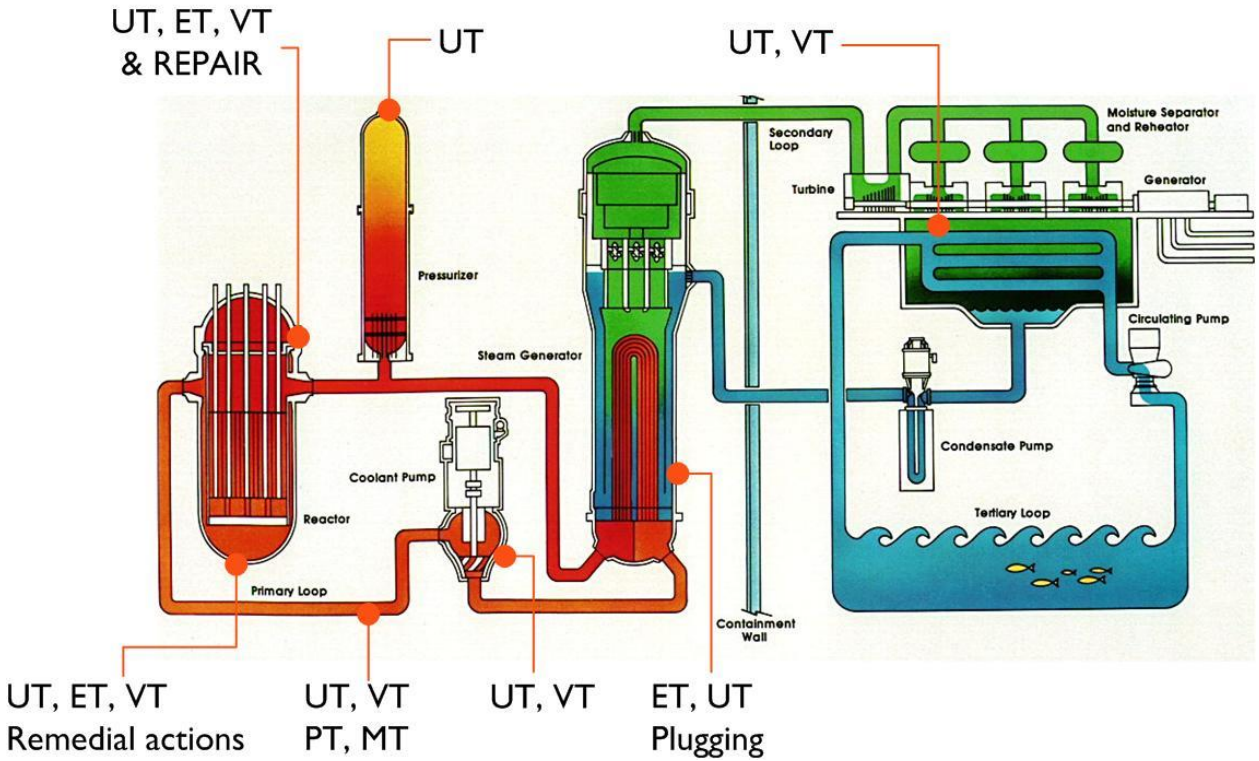
FORERUNNER SYSTEM
Steam Generator
inspection

CASTOR SYSTEM
Steam Generator
inspection

- INETEC’s robotic systems are used for undertaking inspections of all nuclear plant components (PWR and VVER)

That’s what INETEC does

Nuclear



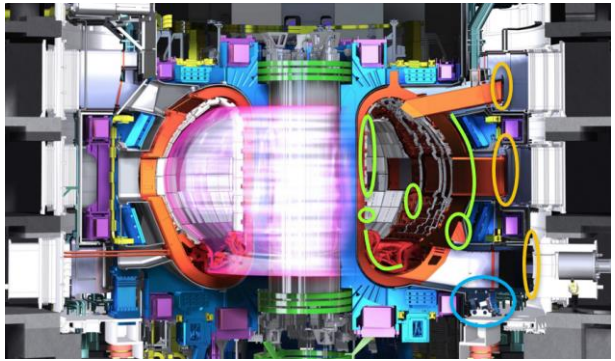
Our Projects & Innovation

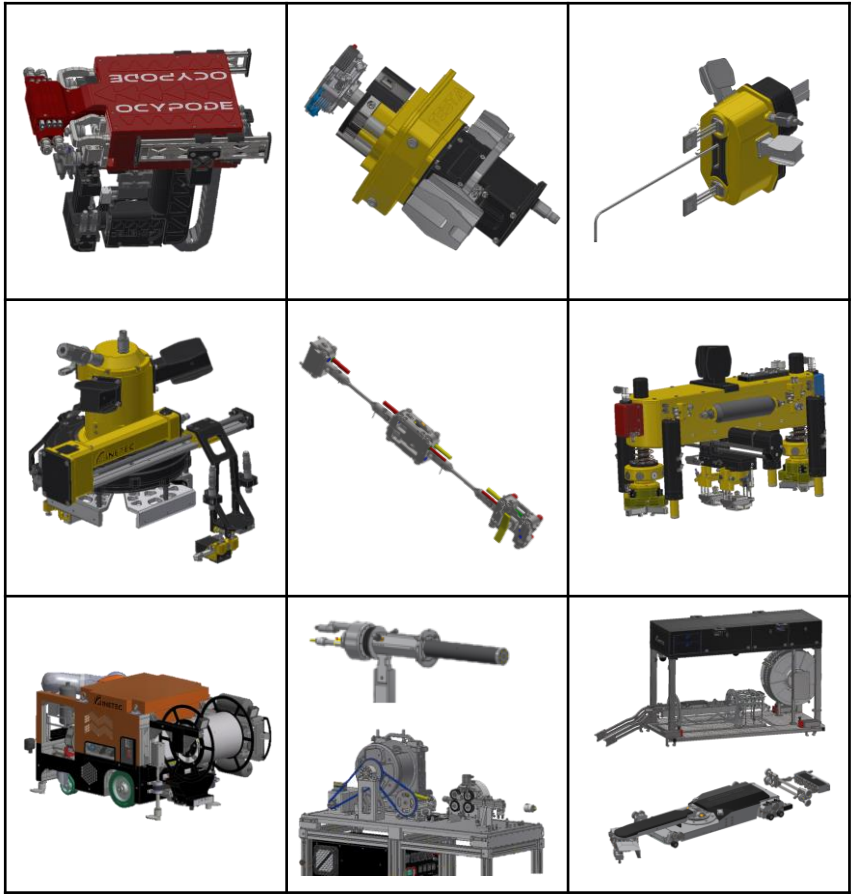
NDT equipment development for ITER project

ITER - international nuclear fusion research and engineering megaproject

- INETEC developed, manufactured 9 inspection robotic systems in collaboration with the University of Zagreb
- Custom design, electronics and SW development
- INETEC will support NDT activities at ITER

Scope of inspection



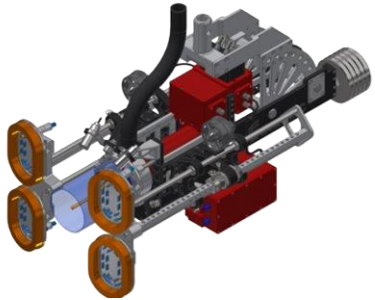


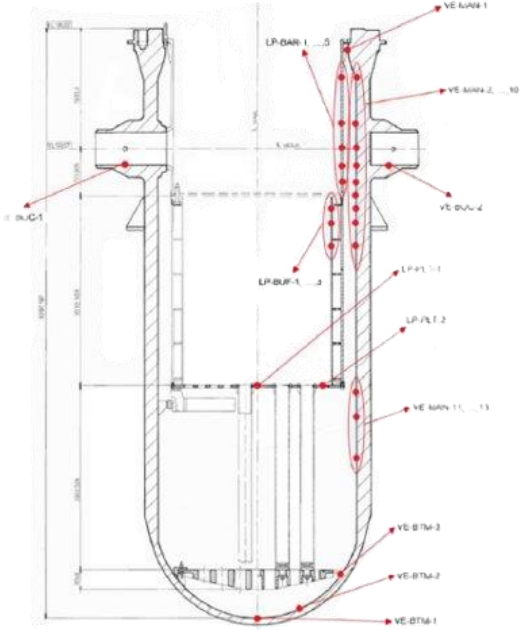
Our Projects & Innovation

SOGIN project

Nuclear power plants decommissioning

- Reactor vessel material sampling
- 3 robotic devices to develop
- 6 months to develop
- Drilling and positioning of the robotic system





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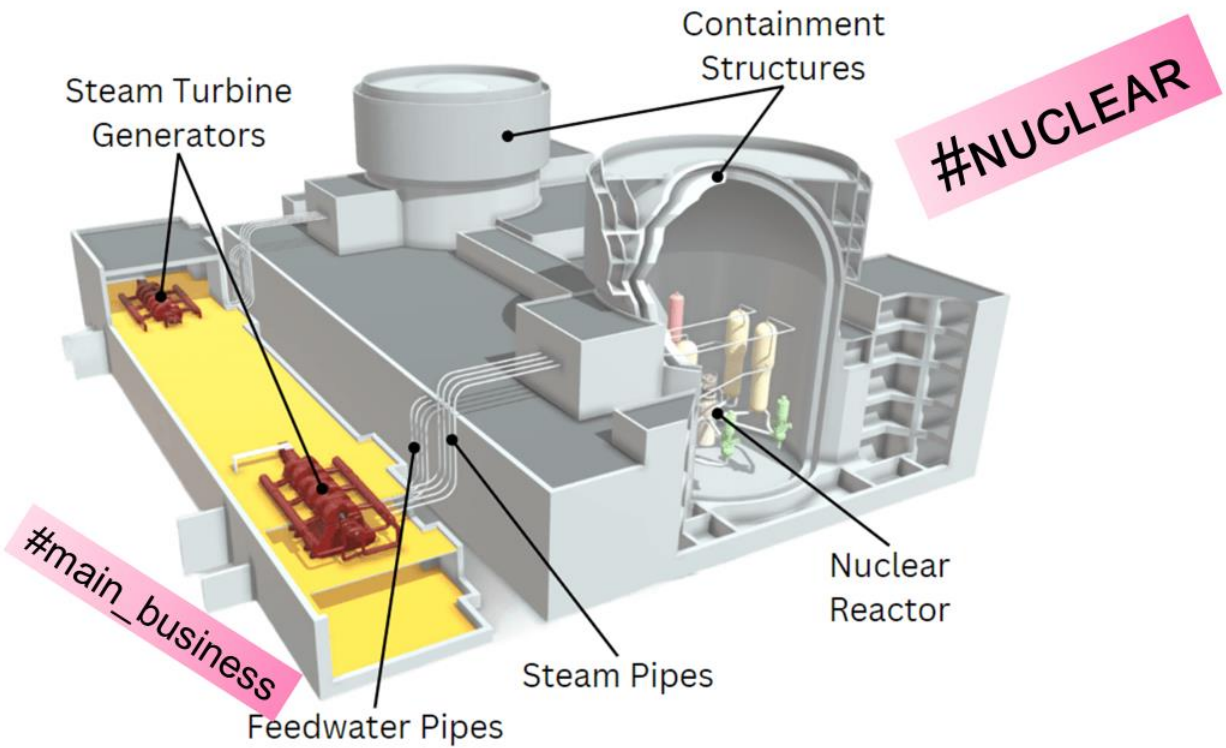

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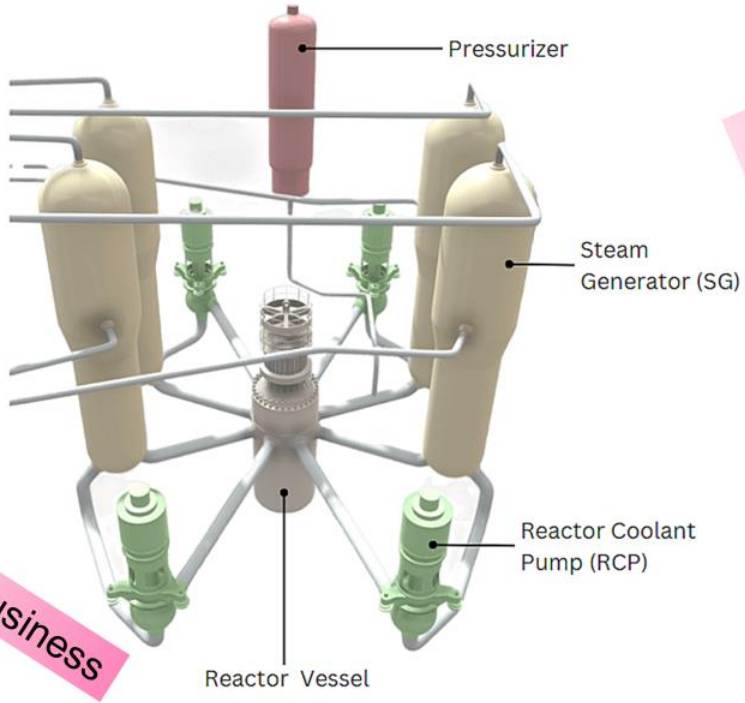

#NUCLEAR

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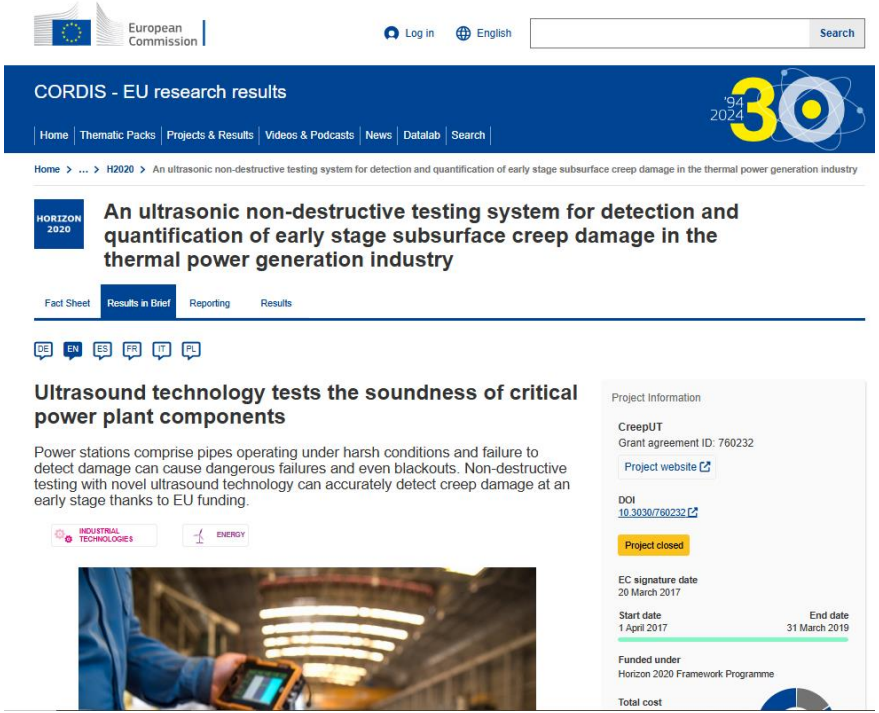

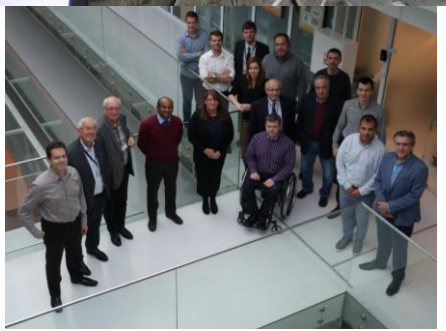

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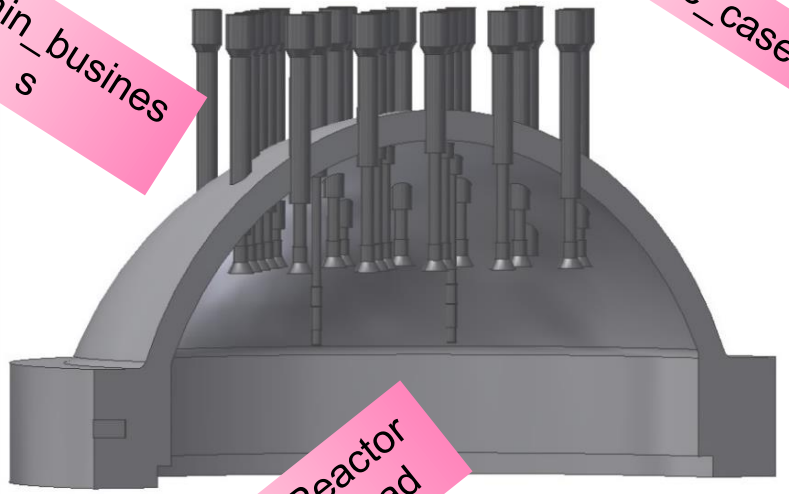

#PWR Reactor Vessel

#PWR Reactor Vessel Head

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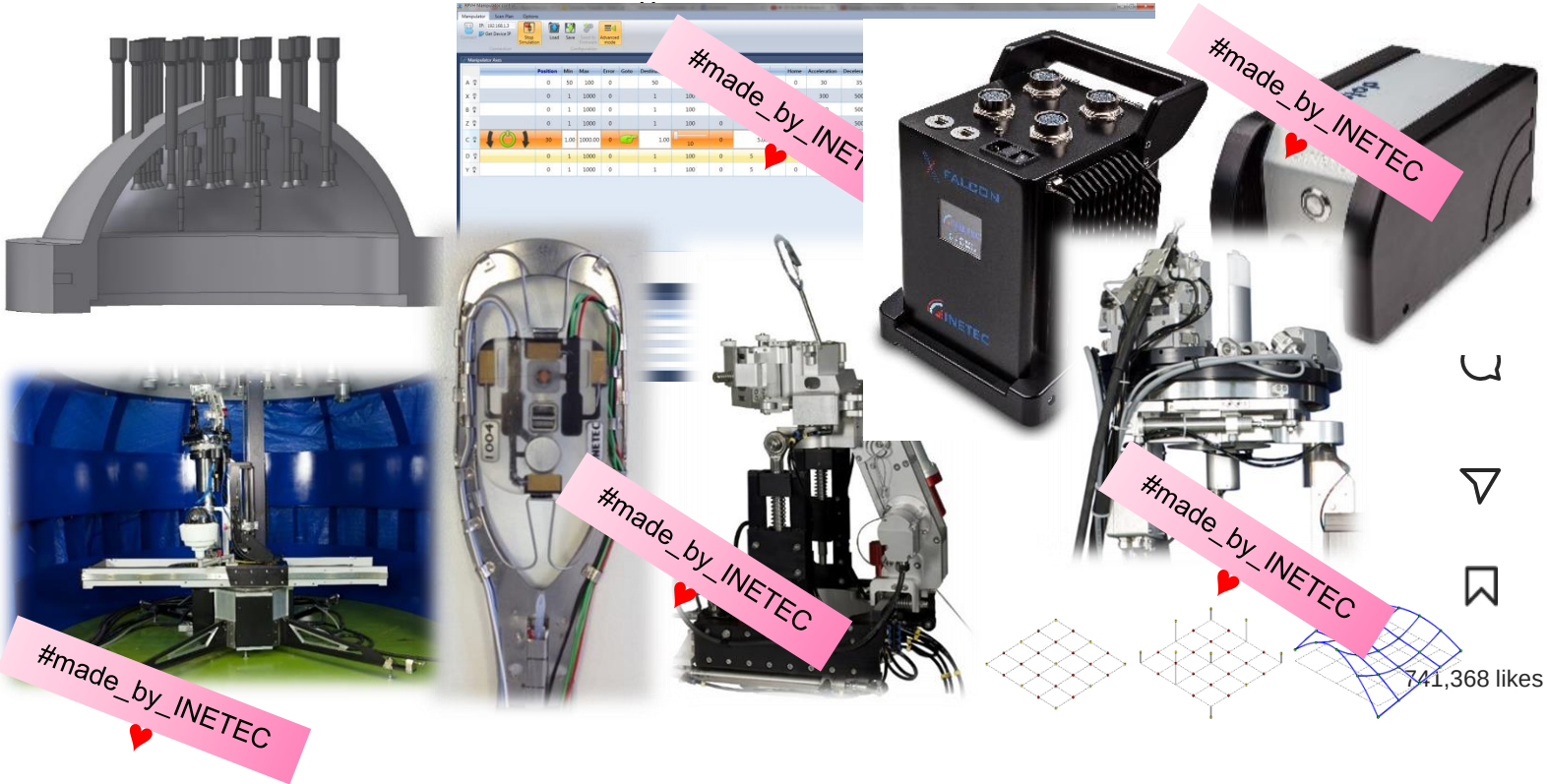

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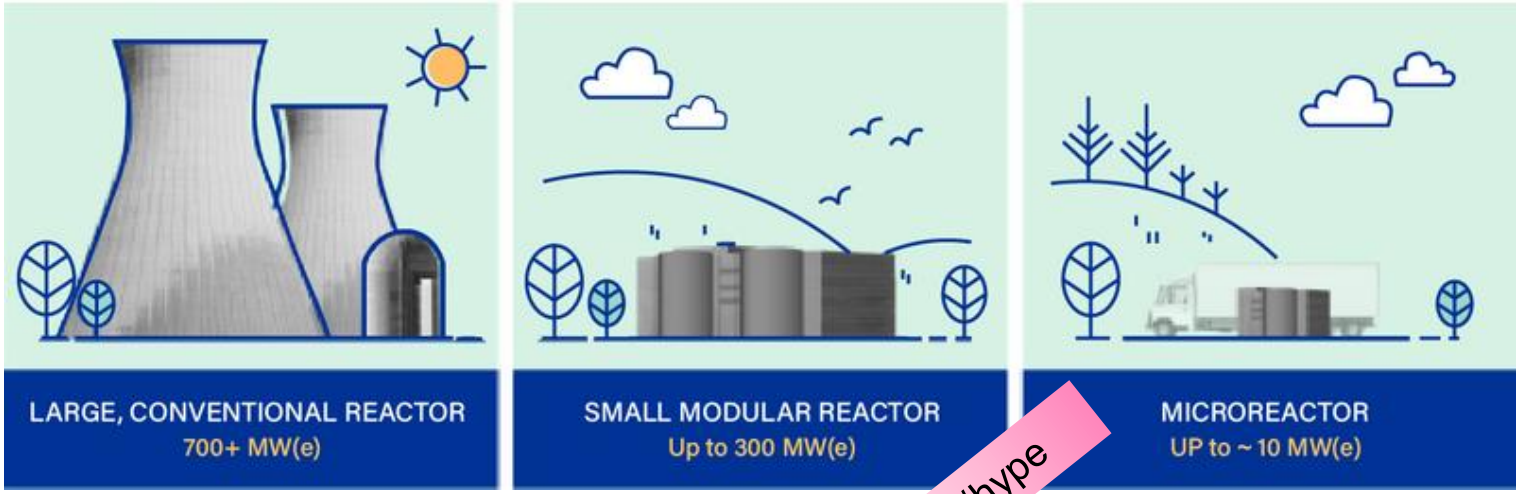

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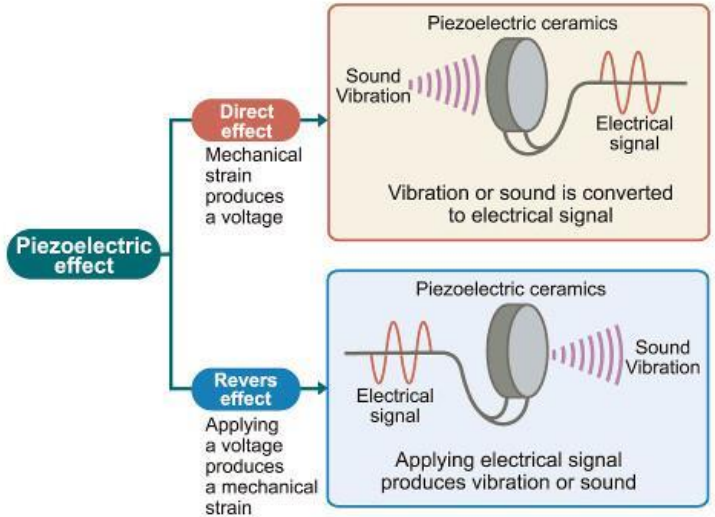

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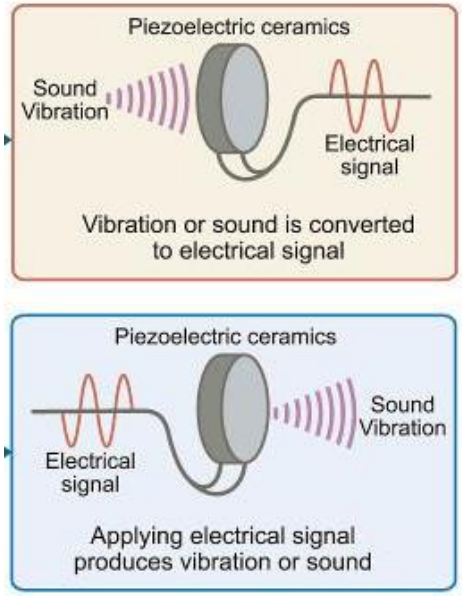

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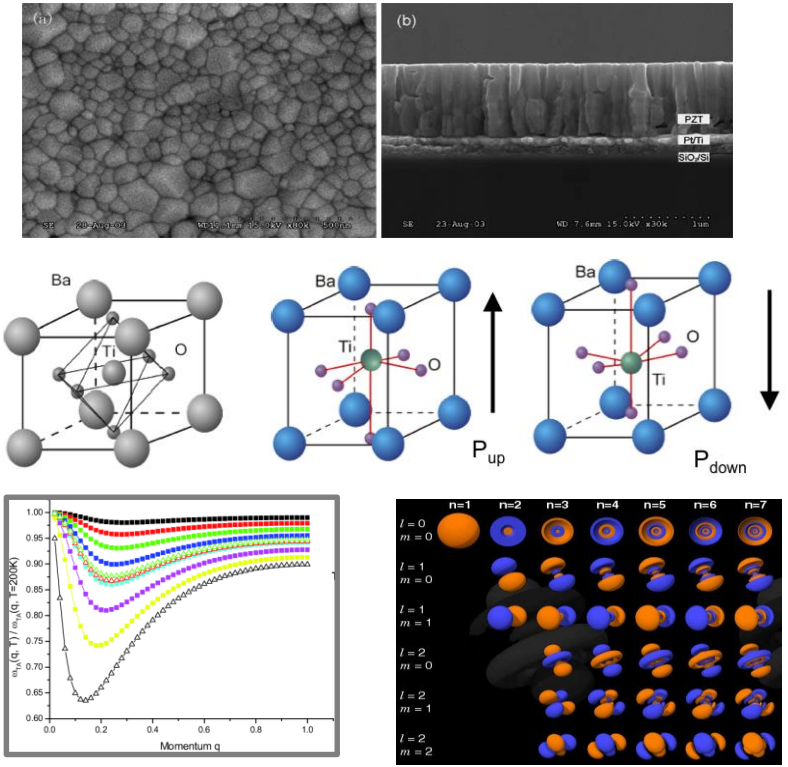

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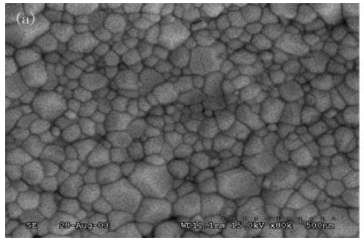

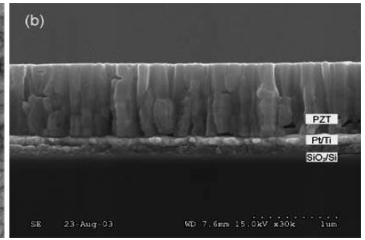

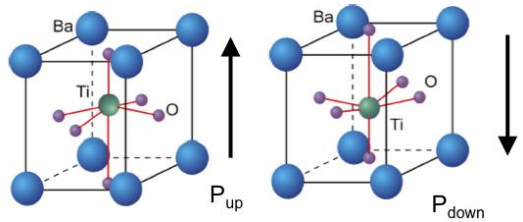

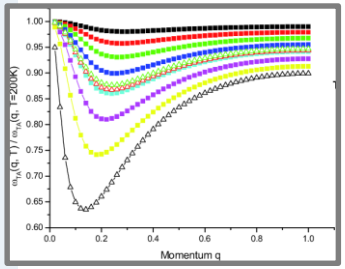

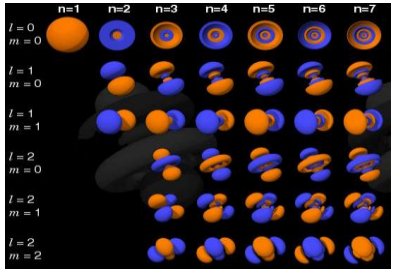

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Internship Programs

Program overview

WHAT?

- Student internship
- 6 weeks duration

WHO?

- 8 students in 2 groups
- Two fields of study:

1. Mechanical design
2. Applied physics

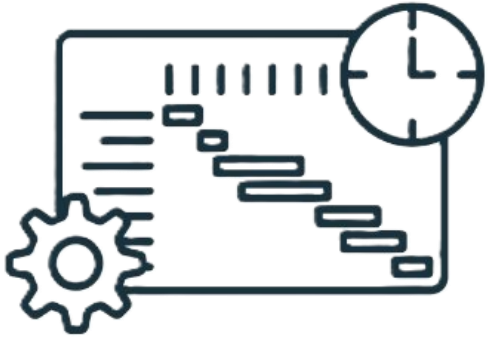
WHEN AND WHERE?

- 1st group: 30th June – 8th August 2025
- 2nd group: 14th July – 22nd August 2025
- Location: Zagreb, Croatia

Program overview

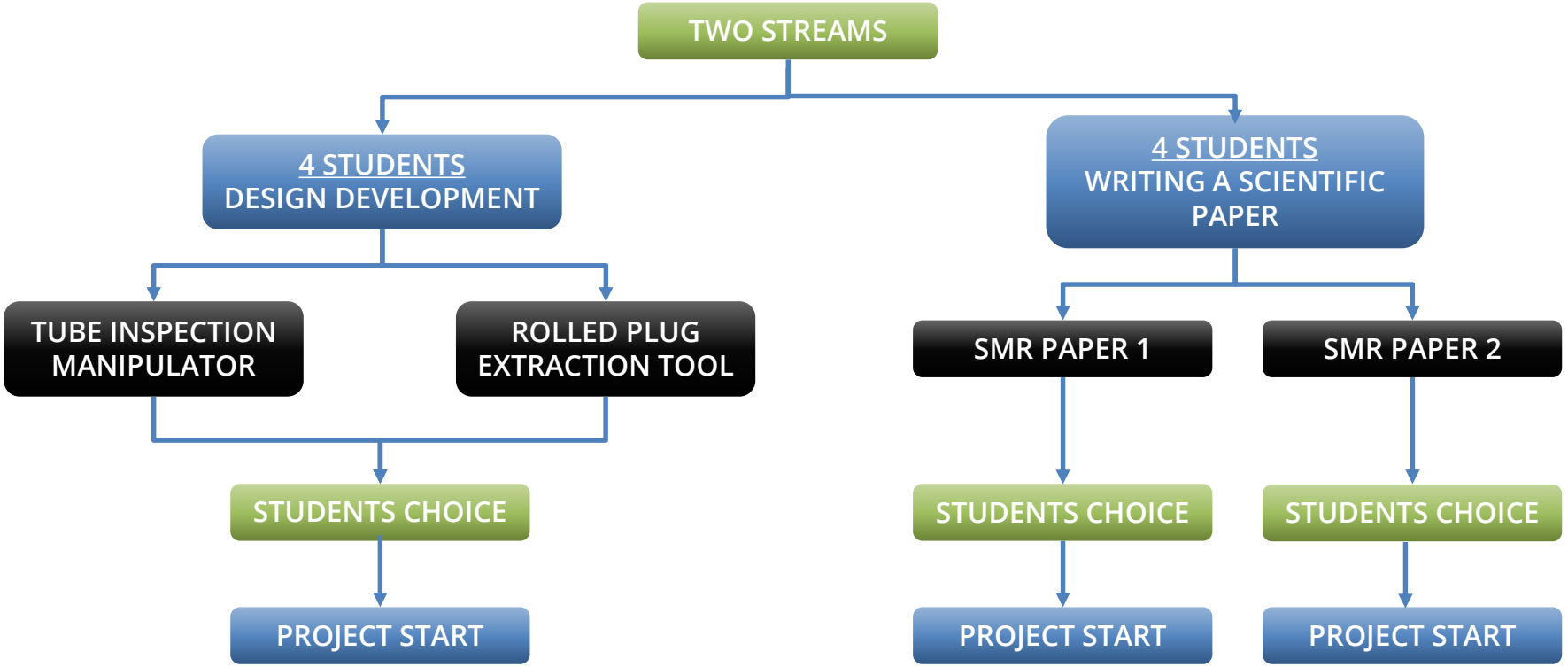
BENEFITS	WHAT DO WE EXPECT FROM INTERNS?	ROLE OF THE MENTOR
• Work on **real projects** • Mentorship and **knowledge sharing** • Provided and **paid accommodation** with **2 meals per day** • Positive and **motivating work environment** • **Daily trip**	• Good **collaboration** with mentors, colleagues, and fellow interns • Motivation and **proactivity** in completing daily tasks • Providing feedback to the mentor after the internship	• Participating in the selection of students for the internship • Introducing students to INETEC's values and culture • **Mentoring and guiding students** in performing business tasks • **Providing feedback** to the student during and after the internship

Program overview – timeline



Activity	2025		
	Jun	Jul	Aug
Project duration	30.06.2025		22.08.2025
First group of students	30.06.2025		08.08.2025
Second group of students		14.07.2025	22.08.2025
Design project milestones	Kick off	Concepts evaluation	1st CAD review, 1st Drawings review, END
Paper writing milestones	Kick off	First paper draft	Paper 1 final submission, Paper 2 final submission

Program overview – project definition flow

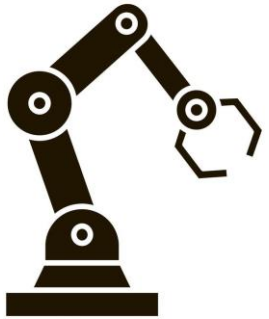


Program overview – design development project definition

PROJECT PHASES	OBJECTIVES	IMPORTANCE GRADING
1	Market and patent research	5
2	Defined morphological matrix	8
3	Functional decomposition of the system	8
4	Engineering calculations	10
5	3 concepts evaluations	10
6	CAD design of one chosen concept	10
7	Drawings detailisation	10
8	Simulations outputs	4
9	Schematics (if applicable)	4
10	Validation plan	8
11	Cost tracking	2

PROJECT STATUS TRACKING

- Daily alignments
- Weekly reviews



Design development PROJECT 1 - Tube inspection manipulator

Designing a Tube Inspection Robot

Goal

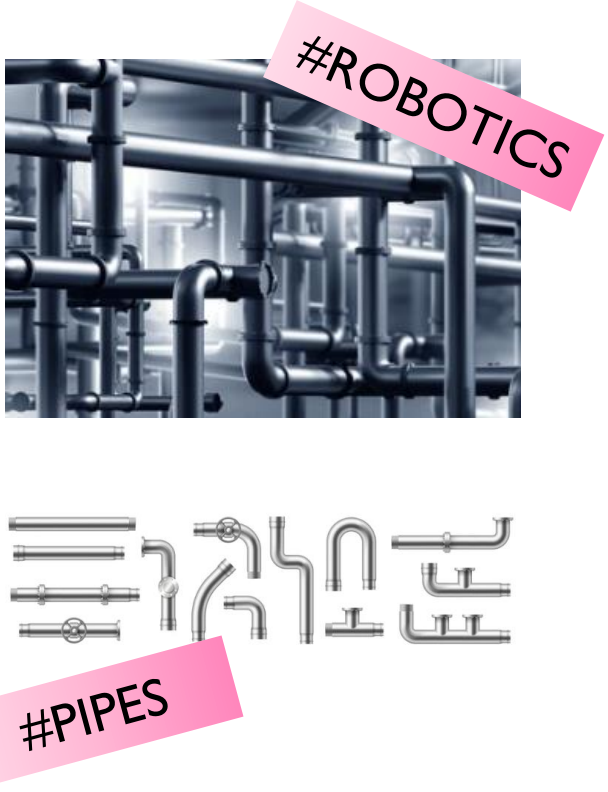
The goal of this project is to develop a robotic manipulator that can inspect the inside of large tubes using Non-Destructive Testing (NDT) without causing any damage.

Why This Is Important

Using this robot, we can check the condition of tubes without taking them apart, which saves time and money while avoiding unnecessary damage. This kind of inspection is crucial in industries like power plants and oil refineries.

What the Tool Needs to Do

The robot is designed to inspect tubes with diameters between 400 mm and 800 mm. A probe mounted on a sled will scan the inner surface of the tube, detecting issues such as cracks or signs of wear. The manipulator must be capable of moving 100 meters deep into the tube, navigating complex pathways, including 90° T-junctions, and climbing vertically when needed.



Design development PROJECT 2 - Rolled plug extraction tool

Development of a Tool to Remove Plugs from Steam Generator Pipes

Goal

The project focuses on creating a tool that can remove plugs from pipes inside a steam generator. These plugs are used to block damaged pipes that were found during an inspection.

Why This Is Important

In steam generators, damaged pipes need to be blocked to stop leaks. Later, when repairs are needed, we must remove these plugs. A specialized tool is required to do this safely and efficiently.

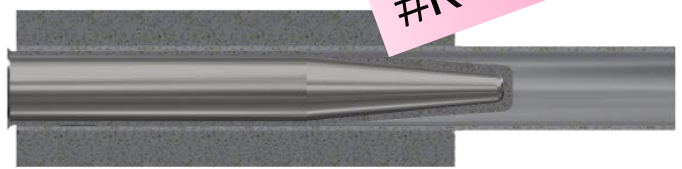
What the Tool Needs to Do

It must work with the Forerunner robotic system (see the picture at the bottom right). This robot will carry and operate the tool.
The tool must be modular, meaning it can be adjusted or changed to remove plugs of different sizes.

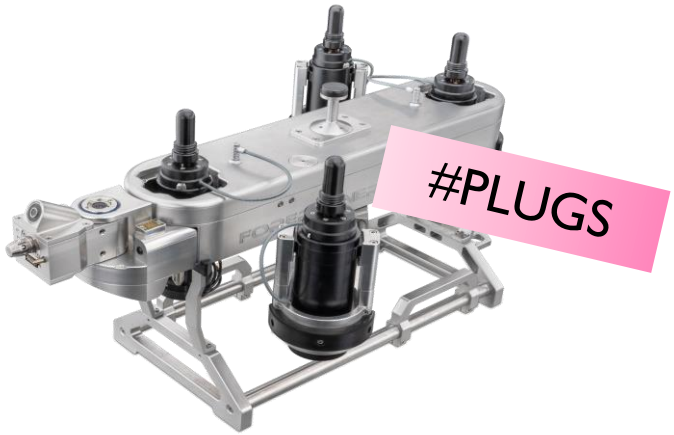
Information Provided

CAD files (3D models) of the Forerunner robotic system and the plug will be shared so the tool can be designed to fit perfectly.

Rolled plug inside the tube

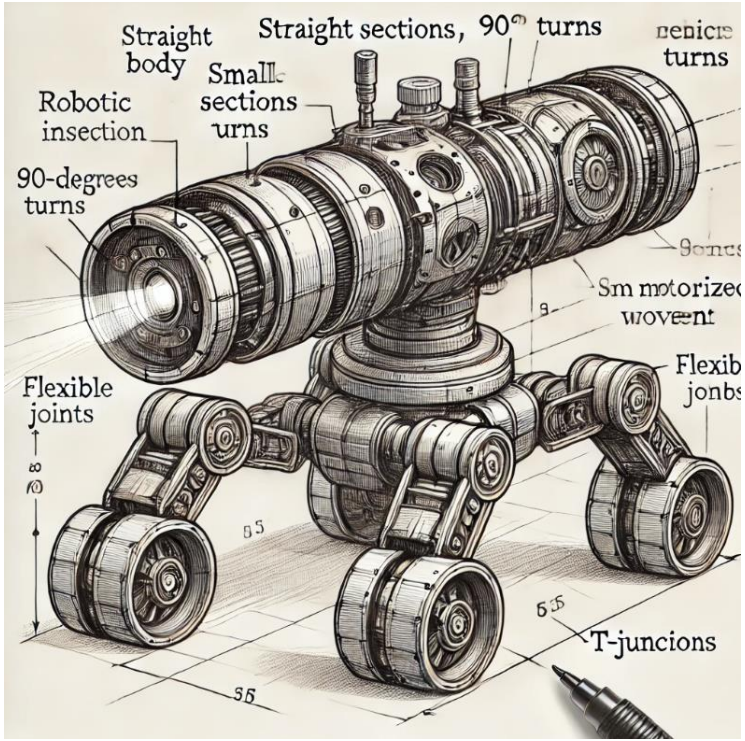


Forerunner robotic system

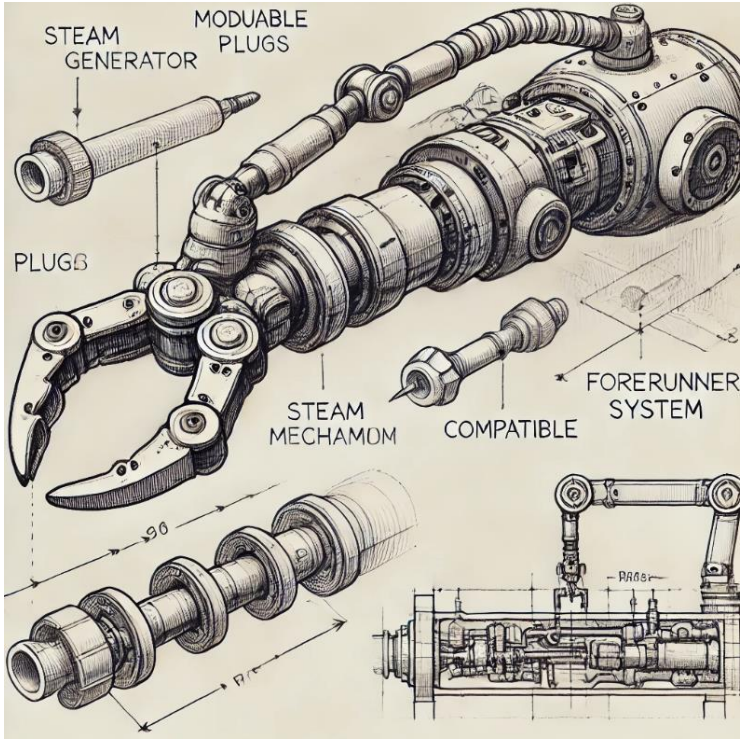


Can you do it better than AI?

Tube inspection manipulator



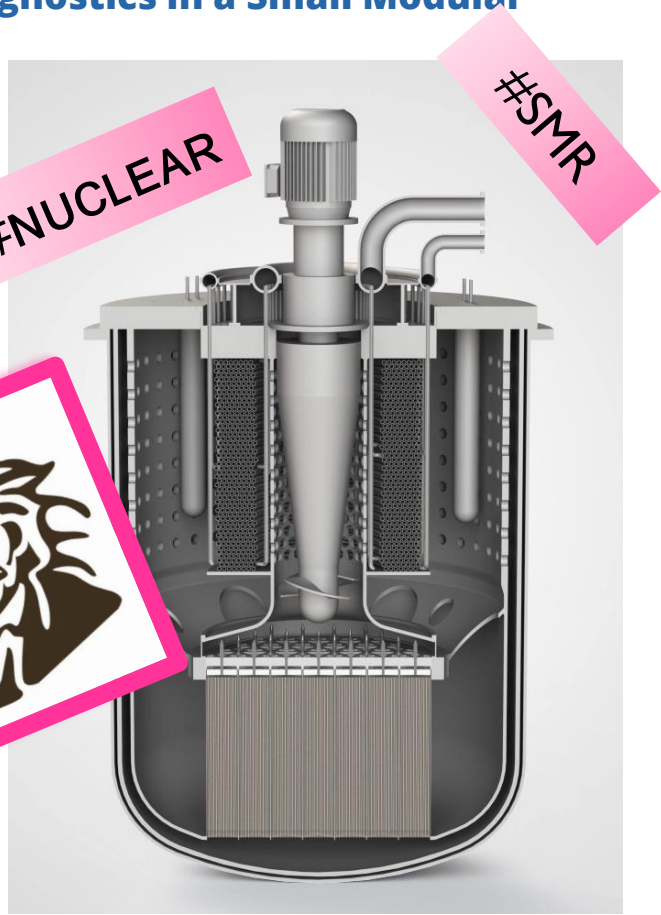
Rolled plug extraction tool



Applied physics PROJECTS 3 – Physics of ultrasound safety diagnostics in a Small Modular Reactor

Ultrasound safety diagnostics in the Inter-Vessel Reactor Space (Hot air environment)

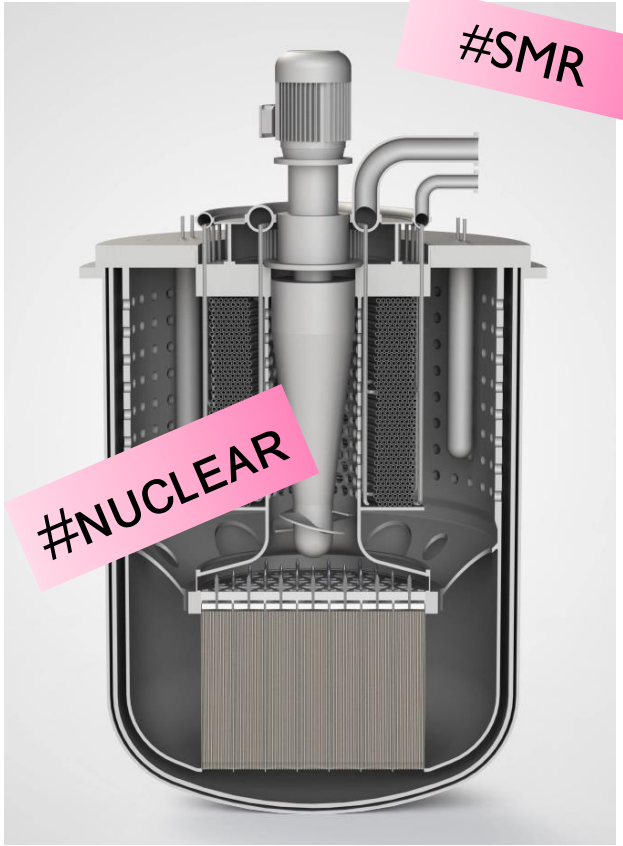
This task will focus on simulating ultrasound-based safety diagnostics in the inter-vessel reactor space of a Small Modular Reactor (SMR), specifically the **newcleo LFR SMR**. The inter-vessel space, filled with hot air or argon, presents unique challenges for ultrasonic inspection, including acoustic impedance mismatches, high temperature, attenuation, couplants and reflection management. The project aims to model ultrasound wave propagation, identify potential inspection blind spots, and evaluate optimal transducer placement. **This is a cutting-edge research that will end with a conference publication.**



Intern responsibilities:

- Conduct literature review on ultrasonic inspection in air environments, particularly in nuclear reactor settings.
- Develop simulation models (in COMSOL Multiphysics, CIVA, ANSYS, or equivalent software package) of ultrasound wave propagation in the inter-vessel air space.
- Analyze the influence of reactor geometry and material properties on signal behavior.
- Optimize transducer configurations for effective defect detection.
- **Participate in writing a conference paper for NENE 2025 Bled Slovenia conference**

Applied physics PROJECTS 4 – Physics of ultrasound safety diagnostics in a Small Modular Reactor



Ultrasound Safety Diagnostics in the Molten Lead Environment of an SMR

This task will explore the complex physics of ultrasonic wave propagation in molten lead within the **newcleo LFR SMR**. Molten lead, as a dense liquid metal, introduces unique challenges such as high attenuation, scattering, and temperature-dependent acoustic properties. The goal is to simulate ultrasonic inspections, investigate material interactions and propose methodologies for effective defect detection in this extreme environment. **This is cutting-edge research that will end with a conference publication.**

Intern responsibilities:

- Review literature on ultrasonic inspection techniques in liquid metal environments, focusing on molten lead.
- Develop and refine simulation models (in COMSOL Multiphysics, CIVA, ANSYS, or equivalent software package) for ultrasound wave propagation in molten lead.
- Analyze the effects of temperature, lead flow dynamics, and reactor geometry on signal behavior.
- Identify potential inspection challenges and propose mitigation strategies.
- **Participate in writing a conference paper for NENE 2025 Bled Slovenia conference**

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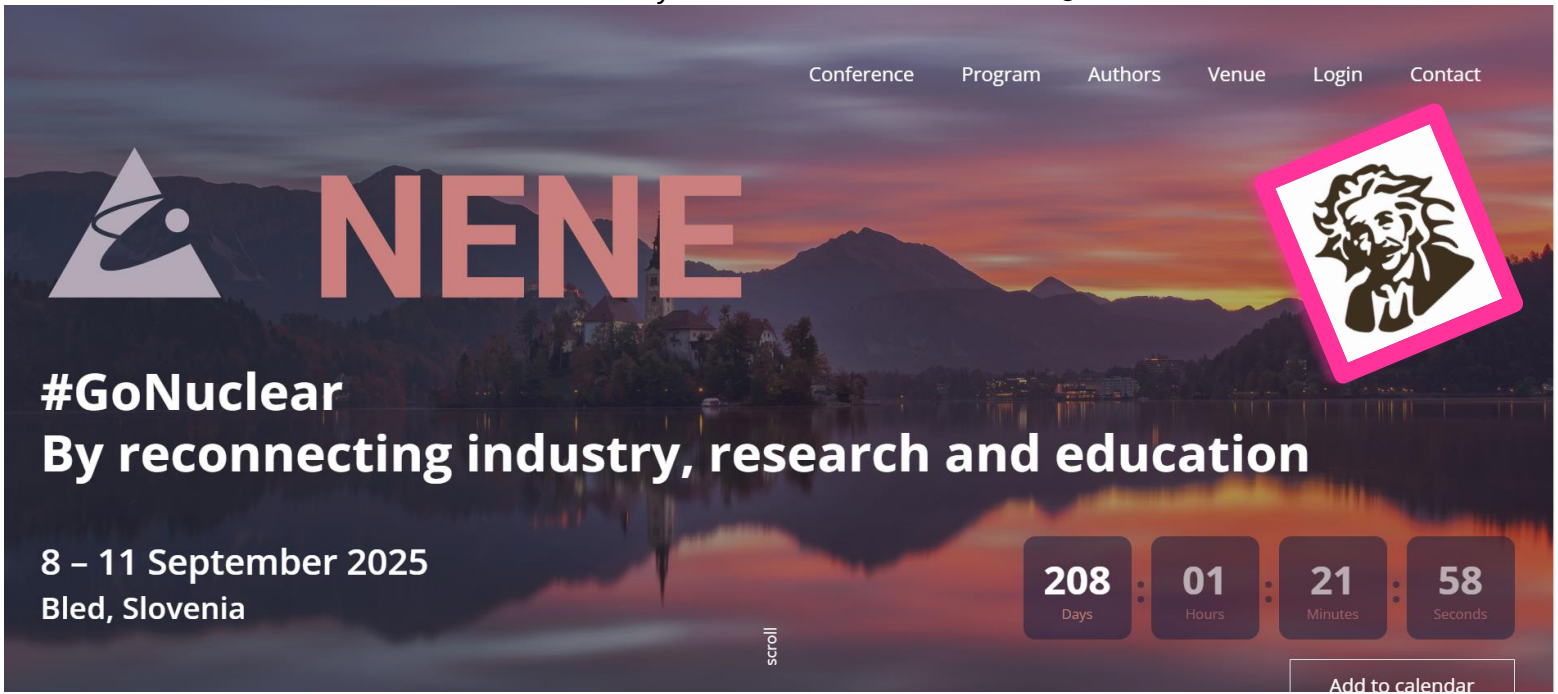


Why Join Us?

Opportunities for STEM Talent

CAREER GROWTH

LEARNING

MENTORSHIP

How to Apply?

Who You Are

PROFILE ASPIRATIONS

- Field of study / Degree
- Passion for research
- Desire to work in laboratory, practical work
- Previous project and research involvement

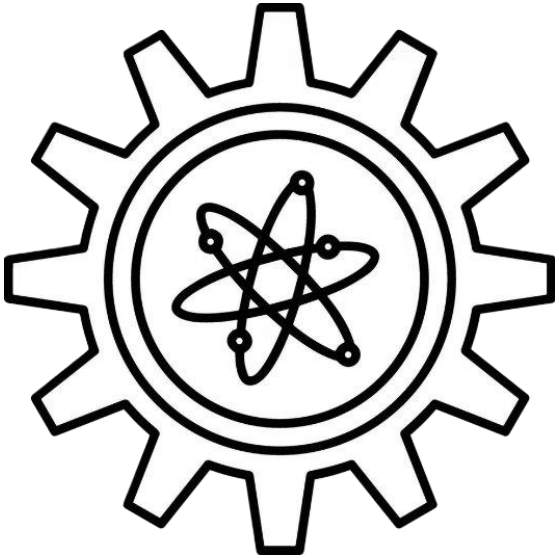
SKILLS

- Problem solver
- Innovative
- Passionate
- Proactive
- Team collaborator

Who You Are

TECHNICAL SKILLS - DESIGNERS

- Mechanical design students
- CAD
- Technical drawing
- Engineering calculations



TECHNICAL SKILLS – SCI-TECH

Strong interest in:

- Mathematics
- Physics
- Programming

Croatia

3.853.000

1.244

Zagreb

770.000

Step-by-Step Guide for the Application Process

1. **Prepare Your Documents**

Resume (CV) – updated and relevant.

Confirmation of GPA

Video (max 2 minutes) – introduce yourself (education, projects, research, awards, why you're the ideal candidate).

- **Please note that you must have a valid passport**

*** Optional**

Letter of Recommendation – from a mentor or professor.

Certificates – relevant to your field.

Project/Research Info – details of any relevant work.

Step-by-Step Guide for the Application Process

2. **Visit Application Website**

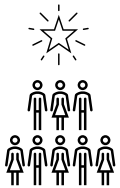
3. **Fill Out the Application Form**
   - Provide **basic info** (name and surname, e-mail, education).
   - **Upload Documents**: CV, confirmation of GPA, video, *letter of recommendation, certificates, project / research info.

   You'll receive a confirmation email immediately.

Step-by-Step Guide for the Application Process

4. **Application Deadline**
   - **Submit by 9th March 2025**
     - We'll get back to you with **feedback by 24th March 2025,** at the latest.

5. **Next Steps**
   - **Online Interview** (duration: 30 minutes)
     - from **31st March – 11th April 2025**



Final decision – 20th April 2025

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